Claims PTO
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1. A radiation spectrum analyzer comprising:

at least one source providing radiation having at least one selected spectral component, said spectral component having an intensity, a center wavelength and a bandwidth;

first optics collecting, dispersing and focusing said radiation to form an image dispersed by wavelength along a dispersion axis onto a plane;

a two dimensional spatial radiation modulator rotated about a rotation axis and positioned in said plane so that said dispersion axis is substantially along a radial axis, said modulator having at least one radiation filter at a radius from said rotation axis, said filter having a radial width substantially defining the bandwidth of a corresponding spectral component of said radiation, said filter modulating the intensity of said corresponding spectral component substantially independent of said bandwidth to provide an encoded beam comprising at least one encoded component, wherein the amplitude of said encoded component changes between three or more substantially distinct levels of contrast as said modulator is rotated about said rotation axis;

a detector;

second optics collecting and directing said encoded beam onto said detector, causing the detector to provide an output; and

computer analyzing signals generated by said detector in response to said encoded beam.

2. A two dimensional spatial radiation modulator adapted to be rotated about a rotation axis to modulate at least one component of an incident radiation beam to encode said beam, said modulator comprising a substrate and at least one radiation filter located at a radius from said rotation axis, said filter comprising an annular region substantially encompassing a plurality of pixels having optical characteristics substantially different from said substrate, said pixels being patterned substantially within said annular region to modulate the intensity of a corresponding component substantially only along an azimuthal axis to provide an encoded component, wherein the amplitude of said encoded component changes between three or more substantially distinct levels of contrast as the substrate is rotated about said rotation axis.

3. A method for analyzing a radiation spectrum, comprising:

providing radiation having at least one selected spectral component, said component having an intensity, a center wavelength and bandwidth;

collecting, dispersing and focusing said radiation to form an image dispersed by wavelength along a dispersion axis onto a plane;

positioning a two dimensional spatial radiation modulator in said plane and rotating said modulator about a rotation axis so that said dispersion axis is substantially along a radial axis, said modulator having at least one radiation filter at a radius from said rotation axis, said filter having a radial width substantially defining the bandwidth of a corresponding spectral component of said radiation, said filter modulating the intensity of said corresponding spectral component substantially independent of said bandwidth to provide an encoded beam comprising at least one encoded component, wherein the amplitude of said encoded component changes between three or more substantially distinct levels of contrast as said modulator is rotated about said rotation axis;

collecting and directing said encoded beam onto a detector; and

analyzing signals generated by said detector in response to said encoded beam.

4. (New) A radiation spectrum analyzer comprising:

at least one source providing radiation having at least two selected radiation components;

first optics focusing said radiation components at substantially different points along an encoding axis in an encoding plane; a two dimensional spatial radiation modulator rotated about a rotation axis and positioned in said encoding plane so that said encoding axis is substantially along a radial axis, said modulator having at least two radiation filters at different radii from said rotation axis for modulating the intensities of said components to provide an encoded beam as said modulator is rotated about said rotation axis;

wherein said first optics includes at least one obscuration to selectively block radiation from one or more of said radiation filters;

a detector;

second optics collecting and directing said encoded beam onto said detector, causing the detector to provide an output; and

computer analyzing signals generated by said detector in response to said encoded beam.

5. (New) The analyzer of claim 4, wherein said obscuration is movable.

6. (New) The analyzer of claim 5, wherein said obscuration is translated along said radial axis.

7. (New) A radiation spectrum analyzer comprising:

two or more different radiation detectors, each said radiation detector responding to radiation in a substantially distinct spectral region of two or more distinct spectral regions;

at least one source providing radiation having at least one selected radiation component in each of said two or more distinct spectral regions;

first optics focusing said radiation component(s) in a first spectral region of said two or more distinct spectral regions at substantially different points along a first encoding axis in an encoding plane, said first optics collecting and focusing said radiation components in a second spectral region of said two or more distinct spectral regions at substantially different points along a second encoding axis in said encoding plane;

a two dimensional spatial radiation modulator rotated about a rotation axis and positioned in said encoding plane so that said two or more encoding axes are substantially along at least one radial axis, said modulator having a plurality of radiation filters at different radii from said rotation axis for modulating the intensities of said components thereby encoding the components to provide two or more encoded beams as said modulator is rotated about said rotation axis, each of said encoded beams containing one corresponding encoded component of said encoded components in said two or more distinct spectral regions;

second optics collecting and directing each of said encoded beams onto a corresponding detector of two or more detectors, causing each said detector to provide an output; and;

computer analyzing signals generated by said detectors in response to said encoded beams.

8. (New) The analyzer of claim 7, wherein one of said two or more distinct spectral regions is substantially defined by the wavelength response of an Indium Gallium Arsenide radiation detector.

9. (New) The analyzer of claim 7, wherein one of said two or more distinct spectral regions is substantially defined by the wavelength response of a Mercury Cadmium Telluride radiation detector.

10. (New) The analyzer of claim 7, wherein one of said two or more distinct spectral regions is substantially defined by the wavelength response of a Lead Selenide radiation detector.

11. (New) The analyzer of claim 7, wherein one of said two or more distinct spectral regions is substantially defined by the wavelength response of a Photo-multiplier tube radiation detector.

12. (New) The analyzer of claim 7, wherein said radiation filters reflect radiation.

13. (New) A radiation spectrum analyzer comprising:

a source comprising radiation from two or more distinct samples;

first optics collecting, dispersing and focusing said radiation from two or more distinct samples to form two or more corresponding dispersed images, said images dispersed by wavelength along two or more corresponding dispersion axes onto a plane, each said dispersed image having a plurality of selected spectral components;

a two dimensional spatial radiation modulator rotated about a rotation axis and positioned in said plane so that said dispersion axes are substantially along at least one radial axis, said modulator having a plurality of radiation filters at different radii from said rotation axis, each said filter modulating the intensity of a corresponding selected spectral component in at least one of said dispersed images to provide two or more encoded beams, each of said two or more encoded beams corresponding to one of said two or more dispersed images, each said encoded beam comprising at least one encoded component from a corresponding dispersed image, wherein the amplitudes of said encoded components change as said modulator is rotated about said rotation axis;

at least one detector;

second optics collecting and directing said encoded beams onto said at least one detector, causing said at least one detector to provide an output; and

computer analyzing signals generated by each said detector in response to said encoded beam.

14. (New) A two dimensional spatial radiation modulator adapted to be rotated about a rotation axis to modulate at least one component of an incident radiation beam to encode said beam, said modulator comprising a substrate and at least one radiation filter located at a radius from said rotation axis, said filter comprising an annular region substantially encompassing a first number of non-contiguous regions having optical characteristics substantially different from said substrate, said non-contiguous regions being patterned substantially within said annular region to modulate the intensity of a corresponding radiation component as a halftone representation of a substantially smooth function having a second number of local maxima as said modulator is rotated one revolution about said rotation axis, wherein said first number of non-contiguous regions is greater than said second number of local maxima.

15. (New) The modulator of claim 14, wherein said non-contiguous regions comprise regions that are non-contiguous along at least a radial direction and a non-radial direction pattern is engineered to increase the number of available levels of contrast in said halftone representation.

16. (New) The modulator of claim 14, wherein said pattern is engineered to control the modulation depth of said corresponding radiation component.